- classification of gums/ hydrocolloid
  - source
    - main source
      - extracts from seaweeds
      - extracts from gums
      - extracts from tubers
      - extracts from plant parts
      - derivative from exudation/sap of trees/ tubers
      - extracts from seed
    - commercially important
      - Botanical, eg:
        - trees-cellulose
        - Tree gums exudates-gum arabic
        - Plant parts-starch,pectin
        - seeds- Guar gum, locust bean gum
        - Tubers- konjec glucomannan
      - Algal, eg:
        - Red seaweed- Agar, carrageenen
        - Brown seaweed- Alginate
      - Microbial, eg:
        - *Xanthan gum*
        - Curdlan
        - Dextran
      - Animal, eg:
        - Gelatin
        - Caseinate
        - Whey protein
        - Chitosan
    - obtained through chemical physical modifications of natural hydrocolloids
      - Cellulose derivative, eg:
        - Carboxymethylcellulose,CMC
        - Methylcellulose, MC
        - Hydoxypropylcellulose
        - Microcrystalline cellulose, MCC
      - Starch derivative, eg:
        - Hydroxypropyl starch
      - Proplylene glycol alginate
      - Low methoxyl pectin
      - Hydoxypropyl guar
  - functional properties
  - Main Hydrocolloid thickenners, eg:
    - Xanthan gum
      - Very high low-shear viscosity (yield stress)
      - Highly shear thinning
      - Maintain viscosity with the presence of electrolyte
      - Over the broad pH range
      - At high temperatures
    - Carboxymethylcellulose
      - High viscosity but reduced by addition of electrolyte
      - At low pH
    - Methyl cellulose & Hydroxypropyl
      - Viscosity increases with temperature (gelatin may occur)
      - Not influanced by addition of electrolyte/pH
    - Galactomannans (Guar & locust bean gum)
      - Very high low-shear viscosity
      - Strongly shear thinning
      - Not influanced by the presence of electrolyte
      - Can degrade and lose viscosity at high & low pH & when subjected
  - Main Hydrocolloid gelling agent
    - Thermoreversible, eg:
      - Gelatin& Agar
        - Gel formed on cooling.
        - molecules undergo a coil-helix transition followed by aggregation of helices
      - Xanthan gum & locust bean gum/konjac mannan
        - gel formed on cooling mixtures
        - Xanthan & Plomannan chairs associate following Xanthan coil-helix transition
        - Locust bean gum-galatose deficient region are involved in the association
      - Kappa carrageenan
        - gel formed on cooling in the presence of salts notably potassium salt
        - molecule undergo a coil-helix transiton following aggregation of helices
        - Potassium ion bind specially to the helices
        - salt- reduce electrostatic repulsion between chains promoting aggregation
      - Low Methoxyl (LM) pectin
        - gels formed in the presence of divalent cations( notably calcium at low pH (3-4.5))
        - Molecules crosslinked by the cations
        - low pH-reduce intermolecular electrostatic repulsion
    - Thermallyy Irreversible-eg:
      - Alginate
        - Gell form on addition of polyvalent cations notably Calcium at low pH (<4)
        - Molecule crosslinked by the polyvalent ions
        - Guluronic acid residues give a buckled conformation
      - High Metoxyl (HM) Pectin
        - Gel formed at high soluble solids (eg, sugar 50%) content at low pH<3.5
        - High sugar content low pH-reduce electrostatic repulsions between chains
        - Chain assosiation-reduced water activity
      - Konjac Manan
        - Gel formed on addition of alkali
        - alkali-removes acetyl groups along the polymer chain
        - Chain association occur
      - Locust Bean Gum
        - Gels formed after freezing
        - Galactose deficient regions association